ORIGINAL RESEARCH PAPER

Volume-7 | Issue-2 | February-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ENDOSCOPIC THIRD VENTRICULOSTOMY FOR AQUEDUCTAL STENOSIS IN CHILDREN BETWEEN SIX TO TWELVE MONTHS OF AGE

Neurosurgery

Sharma Shipra Professor and Head, Department of General Surgery, Pandit Jawahar Lal Nehru Memorial Medical College and Hospital, Raipur,(Chhattisgarh),India

Sahu Rajiv* Associate Professor, Department of Neurosurgery Pandit Jawahar Lal Nehru Memorial Medical College and Hospital, Raipur (Chhattisgarh) India. *Corresponding Author

Sahana Debabrata Assistant Professor, Department of Neurosurgery, Pandit Jawahar Lal Nehru Memorial Medical College and Hospital, Raipur (Chhattisgarh) India

Gupta Gaurav General Surgeon, Ex- Resident, Department of General Surgery, Pandit Jawahar Lal Nehru Memorial Medical College and Hospital, Raipur (Chhattisgarh) India.

Kumar Sanjeev Assistant Professor, Department of Neurosurgery Pandit Jawahar Lal Nehru Memorial Medical College and Hospital, Raipur (Chhattisgarh) India.

Jain Amit Assistant Professor, Department of Neurosurgery Pandit Jawahar Lal Nehru Memorial Medical College and Hospital, Raipur (Chhattisgarh) India

ABSTRACT

Introduction - Hydrocephalus can affect humans even before birth. Many causes have been identified of which aqueductal stenosis has been found in 15% to 60 %of cases. Treatment involves shunt surgery, which is plagued by complications such as shunt malfunction and infections. Of late endoscopic third ventriculostomy has been found to be very effective in aqueductal stenosis. The success rate of ETV in infants varies from series to series. This study analyses the outcomes of ETV in the age group of 6 to 12 months.

Materials and methods- This was a prospective study carried out atDr. B.R.A.M. Hospital, Raipur from March 2015 to September 2016.It comprised of 42 children in the age group of 6 months to 1 year having hydrocephalus due to aqueductal stenosis. They were treated with ETV. Results and complications wereanalysed. They were followed up after surgery upto their discharge & at one month after that.

Results- Of42 patients with aqueductal stenosis who underwent ETV,22 were between 6 to 9 months of age and 20 were between 9 to 12 months of age. The incidence of infective complications in ETV was found to be 8%. None of the patients at discharge showed signs and symptoms of failure but 9 of them presented with such signs and symptoms at the end of 1 month. Of these 6(66.67% of failures) were in the age group of 6 to 9 months and 3(33.3% of failures) in the age of group of 9 to 12 months.The difference was not found to be statistically significant (Chi square – 0.350) although there clearly is a trend towards better success rates in the older age group.

Conclusion –In the age group of 6 months to one year, ETV has excellent outcomes and lesser complications for aqueductal stenosis, with a trend towards better outcomes as age increases.

KEYWORDS

ETV, hydrocephalus, ETV failures, aqueductal stenosis

INTRODUCTION

Hydrocephalus is defined as dilatation of ventricles. It was described by Hippocrates as early as in 466-377 BC, who described symptoms of headache, vomiting, visual disturbance, and diplopia, and explained the illness as a "liquefaction of the brain caused by epileptic seizures"1and also referred to this condition as hydrocephalus, which is derived from the Greek words 'hydro', meaning water and 'kefalé' meaning head. Since then a lot of publications have been made and the pathophysiology of CSF flow has been studied, allowing a scientific approach to classifying this entity on the basis of its aetiology and formulating treatment strategies. The management is mainly surgical. Shunt surgery has been the mainstay of treatment for such patients. Aqueductal stenosis has been found in 15% to 60% 2, 3of hydrocephalus in children and its success rates in them have been found to be as high as 80%.

The purpose of this study was to evaluate the effectiveness of ETV in the age group of 6 months to year for hydrocephalus, which is a well established modality of treatment in children older than year.

MATERIALS AND METHODS

This was a prospective study carried out from March 2015 to September 2016 (duration 18 months). All patients in the age group of 6-12 months, with aqueductal stenosis and hydrocephalus defined by Evan's ratio were included in the study. Radiological assessments were done with either CT scan or MRI where appropriate. Infants below 6 months of age were also excluded, as lack of subarachnoid space development and high failure rate of ETV in this group is described in literature. Total of 42 cases of hydrocephalus with aqueductal stenosis in infants(6months to 1year of age) qualified for inclusion in this study. Twenty- two (52.3%)patientswere in the age group of 6 to 9 months &20 (47.6%) were in the age group of 9 to 12 months. ETV was performed on all of them. Post operative surgical outcome and complications were noted. Patients were followed up in OPDs.

RESULTS

Out of 42 cases in the cohort, 28(66.67%) were males and 14(33.3%)were females. The mean age of the patients was 10.05 months. The presenting features were macrocephaly in all, vomiting in 45.5%, irritability in 42.9%,delayed development was present in 80.4%,fullness of fontanelle and engorged scalp veins in 79.9%, sunset sign in 55.4%, 6th nerve palsy in 17%.In our study the incidence of infective complications was found to be 8%.None of the patients showed signs of ETV failure at discharge.At the end of 1 month 33(78.5%) patients were relieved of their symptoms, of which 16(48.4%)were in the 6 to 9 months age group while 17(51.5%) were in the 9 to 12 months age group. Total of 9(21.4%) patients showed signs and symptoms of ETV failure and underwent VP shunt later. In the age group of 6 to 9 months ETV success was found in 16 of 22 patients i.e. 72.7% while in the age group of 9 to 12 months ETV success was found in 17 of 20 patients i.e.85%. The difference was not found to be statistically significant (Chi square – 0.350) although there clearly is a trend towards better success rates in the older age group.

Table – 1. Results

Outcome	6 – 9 months	9 – 12 months	
Failure	6	3	Chi square – 0.350
Success	16	17	
Total	22(52.38%)	20(47.61)	

DISCUSSION

Hydrocephalus was termed so and described by Hippocrates as early as in 466-377 BC[1].It has been functionally classified into obstructive, where there is a block to CSF flow proximal to arachnoid granulations

and communicating where the block is at the level of arachnoid granulations[4].Infants with hydrocephalus present with large heads, excessive crying and irritability,fullness of fontanelles, engorgement of scalp veins, Macewen's sign (cracked pot sound on percussing over dilated ventricles), 6th nerve palsy, sun-setting sign(upgaze palsy), irregular respiration and widening of sutures[4].

Hydrocephalus may develop either due to decreased CSF absorption or due to excessive production. They may be congenital or acquired. Congenital causes include Chiari 2 malformations associated with meningomyeloceles, Chiari- type 1 malformations due to 4th ventricular outlet obstruction; primary aqueductal stenosis; secondary aqueductal gliosis or Dandy-Walker malformations. Acquired causes include – Infectious- post meningitis, cysticercosis; post-haemorrhagic; secondary to masses -vascular malformations or neoplastic; or may be associated with spinal tumours.[5,6,7]

Early hydrocephalus sometimes may be difficult to identify on MRI/CT scan and therefore certain criteria have been laid down. Most commonly used parameters are temporal horns >=2mm; ratio of distance between frontal horns and inner diameter between tables at this level >5; Evan's ratio, which is the ratio of distance between frontal horns and maximum biparietal diameter,>0.3; upward bowing of corpus callosum; ballooning of frontal horn(mickey-mouse sign) and third ventricle; periventricular hypo density on CT or hyperintensity on T2WI on MRI[8].It should be differentiated from – hydrocephalus ex vacuo, agenesis of corpus callosum, septo-optic dysplasia.

Management of hydrocephalusonce established is primarily surgical, medical management beinglimited to diuretic therapy to buy time for surgery. Surgery should aim at maximizing neurological improvement rather than trying to obtain normal sized ventricles[4]. Dandy had described Choroid plexectomy in 1918 for communicating hydrocephaluswhich was associated with high mortality[9]. Eliminating the obstruction- vascular malformation, neoplasm or cyst, has lead to resolution of hydrocephalus. Various shunts- ventriculo-atrial, ventriculo-pleural have been tried, but by far the most commonly performed procedure is ventriculo-peritoneal shunt. Endoscopic third ventriculostomy has found success in relieving certain kinds of hydrocephalus and has the advantage of not leaving any hardware insitu.

The failure rates of ETV have been found to be higher in infantsless than 90 days and in those with meningomyelocoele[10].ETV success rates have been found to vary from 20% to 70% in infants less than 1 year of age[11,12,13,14].Formation of new arachnoid adhesions and complete closure of ETV stoma has been found in redo surgeries.[15]

In our study, 9patients (21.4%) showed signs of ETV failure and had to be taken up for shunt surgery.Kulkarni et al found lower risk of ETV failure right from the early postoperative period, which became even more favourable with time[16].Mohanty et alreported 6–15% ETV failures due to re-closure of the stoma from gliosis. They reported ETV failure in 13, of which 8 were infants[17].The high rate of re-closure in infants has been ascribed to impeded CSF absorption leading to a greater tendency of new arachnoid membrane formation and growth of gliotic, ependymal, and scar tissue. Stoma size and Liliequest membrane perforation are also equally important. ETV depends upon pressure difference between third ventricular and subarachnoid spaces, which is present before surgery, but is lost with time as ETV starts functioning and leads to stoma closure and ETVfailure. In infants with openfontanelles, gradient development fails to occur between two compartments, leading to low success rate of ETV as compared to adults.

In our study, intraoperative complications were found in 3 of 42(7.1%) mainly bleeding.Erşahin et al have found low intraoperative complication rates in ETV .[18]

In our study the incidence of infective complications were found to be 8%.CSF leaks were seen in 4 (9.5%). All infective complications of ETV were after CSF leak though scalp incision, which developed due to ETV failure. All these patients had very thin cortical mantle to seal the ETV entry site in cortex. Erşahin et al have also reported a significantly lower infection rates in ETV (1-5%). It was also noted that, infections in children with ETV have a more benign course and tend to subside with antibiotic treatment alone. Other complication that was found was seizure in 1(2.3%) which was controlled with extra doses of antiepileptics. The average post-op hospital stay was 8.09 days.Study conducted at Netherlands suggested that ETV has a lower risk profile in infants and should be the initial choice while the immune system in these children is still immature, thereby postponing shunt implantation[19].

While comparing the success of ETV between the age groups, ETV success was found in 16 of 22 patients i.e. 72.7% in the younger age group, while in the age group of 9 to 12 months ETV success was found in 17 of 20 patients i.e.85%. The difference was not found to be statistically significant (Chi square – 0.350) although there clearly is a trend towards better success rates in the older age group. The overall success rate for the cohort was 78.5%.Javadpour et al. found success in 33% of ETV cases emphasizing on the aetiology as a causative factor[20].Baldauf et alin their study on ETV in children less than 2 years of age with non-communicating hydrocephalus found success to be determined by both age and cause. They found success in 43% cases, with better results in patients with aqueductal stenosis[21].The study conducted by Warf et al, of ETV outcomes in 153 infants, found overall success rate of 53% including 40% in patients with myelomeningocele and 70% in aqueductal obstruction[22].Sufianov in his study found, ETV success in children less than 2 years of age, to be related to the thickness of the floor of the third ventricle and the patient's age at first manifestation of hydrocephalus, rather than ageof patient.[23]

CONCLUSIONS

In infants with aqueductal stenosis, between 6 months to one year age, ETV has acceptable chance of success and lower complication rates, with a trend towards better outcomes in older age groups.

REFERENCES

1. Aschoff A, Kremer P, Hashemi B. The scientific history of hydrocephalus and its treatment. Neurosurgical Review. 1999;22:67–93
2. Hirsch JF, Hirsch E, Sainte-Rose C, et al: Stenosis of the aqueduct of Sylvius (etiology and treatment). J NeurosurgSci 30: 29-39, 1986
3. Jellinger G: Anatomopathology of nontumoral aqueductal stenosis. J NeurosurgSci 30: 1-16, 1986
4. Mark S Greenberg. Hydrocephalus. Handbook of Neurosurgery;7th edition; Chapter15;307-337
5. Amacher A L, Wellington J: Infantile hydrocephalus: Long-term results of surgical therapy. Childs Brain II: 217-29.1984.
6. Hill A. Rozdilsky B: Congenital hydrocephalus secondary to intra-uterine germinal matrix/intraventricular hemorrhage. Dev Med Child Neurol 26: 50927, 1984.
7. Kudo H. Tamaki N, Kim S, et al.: Intraspinal tumors associated with hydrocephalus. Neurosurgery 21: 726-3). 1987
8. LeMay M. Hochberg F H: Ventricular differences between hydrostatic hydrocephalus and hydrocephalus ex vacuo by CT. Neuroradiology 17: 191-5. 1979.
9. Dandy W E: Extirpation of the choroid plexus of the lateral ventricle in communicating hydrocephalus. Ann Surg 68: 569-79.1918.
10. Sarah C. Jernigan, Jay G. Berry, Dionne A. Graham, LilianaGoumnerova. The comparative effectiveness of ventricular shunt placement versus endoscopic third ventriculostomy for initial treatment of hydrocephalus in infants. J Neurosurg Pediatrics 13:295–300, 2014
11. Egger D, Balmer B, Altermatt S, Meuli M: Third ventriculostomy in a single pediatric surgical unit. Childs NervSyst 26:93–99, 2010
12. Faggin R, Bernardo A, Stieg P, Perilongo G, d'Avella D: Hydrocephalus in infants less than six months of age: effectiveness of endoscopic third ventriculostomy. Eur J PediatrSurg 19:216–219, 2009
13. Fritsch MJ, Kienke S, Ankermann T, Padoin M, Mehdorn HM: Endoscopic third ventriculostomy in infants. J Neurosurg 103 (1 Suppl):50–53, 2005
14. Goumnerova LC, Frim DM: Treatment of hydrocephalus with third ventriculocisternostomy: outcome and CSF flow patterns. PediatrNeurosurg 27:149–152, 1997
15. Wagner W, Koch D: Mechanisms of failure after endoscopic third ventriculostomy in young infants. J Neurosurg 103 (1 Suppl):43–49, 2005
16. Kulkarni AV, Drake JM, Mallucci CL, Sgouros S, Roth J, et al. Endoscopic third ventriculostomy in the treatment of childhood hydrocephalus. J Pediatr. 2009 Aug;155(2):254-9.e1.
17. Mohanty A, Vasudev MK, Sampath S, Radhesh S, SastryKolluri VR. Failed endoscopic Third ventriculostomy in children: management options. PediatrNeurosurg. 2002; 37:304–9
18. Erşahin Y, Arslan D. Complications of endoscopic third ventriculostomy. Childs Nerv Syst. 2008;24:943–8
19. Balthasar AJ, Kort H, Cornips EM, Beuls EA, Weber JW, Vles JS. Analysis of the success and failure of endoscopic third ventriculostomy in infants less than 1 year of age. Childs Nerv Syst. 2007;23:151–5.
20. Javadpour M, Mallucci C, Brodbelt A, Golash A, May P. The impact of endoscopic third ventriculostomy on the management of newly diagnosed hydrocephalus in infants. PediatrNeurosurg. 2001; 35:131–5.
21. Baldauf J, Oertel J, Gaab MR, Schroeder HW. Endoscopic third ventriculostomy in children younger than 2 years of age. Childs Nerv Syst. 2007; 23:623–6.
22. Warf BC. Hydrocephalus in Uganda: The predominance of infectious origin and primary management with endoscopic third ventriculostomy. J Neurosurg. 2005; 102:1–15.
23. Albert A. Sufianov .Endoscopic third ventriculostomy in patients younger than 2 years: outcome analysis of 41 hydrocephalus cases. Journal of Neurosurgery; , May 2012 / Vol. 116 / No. 5 , 392-401